16. The impact of birds on the lacustrine ecosystem

Claude Dejoux

Lake Chad is situated on one of the major pathways of migratory birds between Europe and the tropical countries of Central and Eastern Africa. In most cases it is only a halting spot for destinations further south and the migrants only use the lake as a resting place, not intensively utilizing its food resources. However, the morphology of the lake basin varies with changes in water level and the relationship between the lake and its bird fauna can be profoundly changed, so that while the periods of high water provide birds with a resting place only, the periods of low water provide the birds with vast mud flats or large sandy beaches with abundant food, for which the birds stop.

Apart from these periods when the migratory birds are particularly abundant there is a mainly sedentary bird fauna which makes regular and more or less intensive use of the lake ecosystem.

According to oral tradition, there were periods when the lake was visited by numerous birds nesting in the islands! If these data are accurate, there must be a period of heavy predation in the aquatic ecosystem corresponding to major nesting, if only to feed the young. However, during the observations made between 1965 and 1973, we did not notice any considerable increase in the lacustrine fauna, although the lowering of the lake water contributed to the establishment of a population of Limicolae resulting from the development of muddy areas. The only large aggregations of birds observed were temporary and did not correspond to a nesting.

It was possible to determine the diets of numerous bird species observed in Lake Chad through the analysis of more than one thousand stomach contents. They can be divided into four main groups according to their use of the aquatic biotopes.

16.1 Birds closely dependent upon the aquatic environment

There are two distinct groups of birds: the pelicans and shags, and the river eagles. The first two are mainly ichthyophagous and inhabit privileged zones

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such as the Shari delta. Here, food is abundant, and, in certain periods, they make use of the fish aggregations that migrate upstream for spawning. Shags are found along reed belts where they catch fish in submerged vegetation and use papyrus as a resting place. They are also found in large quantities in the arms of the drying up lake where the ichthyofauna is confined. The river eagles have an ichthyophagous diet and although dead fishes represent their main food, they will occasionally feed on other dead animals.

During flight many birds use the environment in relation to the aggregations of encountered prey. Although the scissor-bills are present mainly on the large rivers, they do not avoid the delta zone or the southeastern aquatic vegetation mats. They feed mainly on small fishes captured by scooping through the water with their wide open bills.

Caspian and gull-billed terns are mainly ichthyophagous, while the whiskered and white-winged black terns have a mixed diet of fish and insects. The large emergence of Chironomids or May-flies often leads to considerable aggregations of white-winged black terns which occasionally feed on aquatic vegetation.

The occurrence of red-necked little bitterns and king-fishers is related to the presence of resting places. Although they are very abundant on the river banks, they also occupy the reed belts of the islands belonging to the lake archipelagoes. Red-necked little bitterns feed almost exclusively on small fishes, the big aquatic insects being ingested only accidentally.

Finally, two groups of birds occupy two large biotopes; the submerged vegetation and the mud flats.

— Aquatic mats with *Potamogeton* are occupied by the largest density of birds. The lily trotter and the lesser lily trotter are found on the surface leaves and utilize insects from the vegetation as well as the insect larvae living near the surface (Odonata and Hemiptera). In certain periods, this submerged vegetation is also occupied by Anatidae, especially the common teals, the pygmy teals, the hottentot teals and the cape widgeons. The shovellers are much less numerous but they are also found in these biotopes. Anatidae use a part of the aquatic mats up to 10 cm in thickness in addition to the emergent zone. Common and hottentot teals are mainly insect feeders, while the other two species feed on grains and vegetation and also feed on a small amount of insects.

— Mud flats are certainly the most utilized biotopes in Lake Chad, within the limits mentioned at the beginning of the chapter. They represent the favourite habitat for waders: African great white herons, spoonbills, black-winged stilts, open-bills. The last two species feed mainly on molluscs, while the first two capture mainly fishes and insects.

While the large waders most often live isolated or in small groups, the small limicolae are sometimes found in large aggregations. The redshanks, the marsh sandpipers or the wood sandpipers should be mentioned here as well as various small sandpipers which feed on the epifauna of the wet mud flats or the fauna of

the shallow flooded zones. In the latter case, they feed mainly on chironomids, small Hemiptera and Coleoptera: Dytiscidae.

16.2 Birds with a mixed diet

About 50% of the mixed diet consisted of aquatic organisms and 50% of it was terrestrial.

At first, we find a group of Passeriformes which catch prey during flight and stay fairly close to the reed belts that are used as resting places. Similarly, the sand martins and the wire-tailed swallows, the big and small cane-warblers, the Senegal fire-finch, the beautiful long-tailed sunbird and the West African prinia chase prey above the open water. Close to the papyrus or *Phragmites* reeds, the various bee-eaters intensively feed on insects and accordingly their diet contains elements from the aquatic environment only (Odonata, Chironomids) or is of terrestrial origin (Acrididae, Diptera and Carabidae).

Some birds found in marshy zones or along the islands lined with aquatic mats, use either the insects, the invertebrate fauna or the small aquatic vertebrates. They include the black crake, the African green-backed heron, the African little grebe, the pygmy kingfisher and the African moorhens. Finally, along beaches or in flood zones, there are birds with a mixed diet that feed on the dominant prey organisms present. They include among others a few Anatidae such as the spurwinged goose, the pintail, the white-faced duck or certain limicolae whose dominant species are the little stint and the ruff and reeve.

16.3 Birds using the aquatic environments as a supplementary feeding ground

This group include a collection of birds which, apart from the garganey are not dependent upon the aquatic environment but make slight and occasional use of it from time to time.

This collection is very dissimilar and includes small passeriformes such as the lesser white-throats and grey backed camaroptera, the rufous grass-warbler, the Niger black headed weaver as well as birds of prey such as the West-African black kite, the spotted and milky eagle owls. Finally, along the banks or on the beaches the Egyptian plovers, the dusky redshank and the West African pratincole use equally the terrestrial or aquatic insect fauna.

16.4 Birds occasionally using the environment

It is hardly possible to speak of exploitation in this case as the predation by certain species is so low and occasional. We will merely give a list of birds which can move near the aquatic environment and which can take prey from these

biotopes without particularly searching for them. Their impact can be considered as insignificant. Among these species are the little egret, the West African hadada, the comb goose, the Senegal thick-knee and the plovers, the nightjars, the little African swift, the wood-warbler, the redpate grass-warbler, the slender-billed weaver ...

They are usually entomophagous birds which occasionally ingest aquatic insects after their emergence.

16.5 Conclusion

Considering its size and variety, the aquatic environment of Chad in general and Lake Chad in particular is not greatly used by the birds. Out of 183 taxa studied, only 84 contained a significant quantity of aquatic organisms in their stomach and hardly twenty of them can be considered as closely related to the freshwater environment. Apart from the open waters, the zones used are usually very localized as shown in Fig. 1 and the coastal environments are the only ones to be visited regularly.

Of course, the birds do not escape the general and sometimes favourable 'glut of prey', and predation on the environment is therefore exclusive and intensive. So, we could observe considerable aggregations of terns and swallows that were very localized at the time of large emergence of chironomids in the Archipelago or considerable aggregations of ichthyophagous birds during traditional fisheries. Finally, the combined presence of important bird aggregations and a very dense aquatic fauna leads to a considerable but temporary use of the environment as sometimes observed in the developing polders of the arms of the Lake Chad archipelago. It was not uncommon then to find 10 to 15 000 Chironomid larvae in the stomach and crop of a cape widgeon. When it is known that several thousands of such birds occupied this kind of environment in certain periods, it is not necessary to dwell on the importance of their impact.

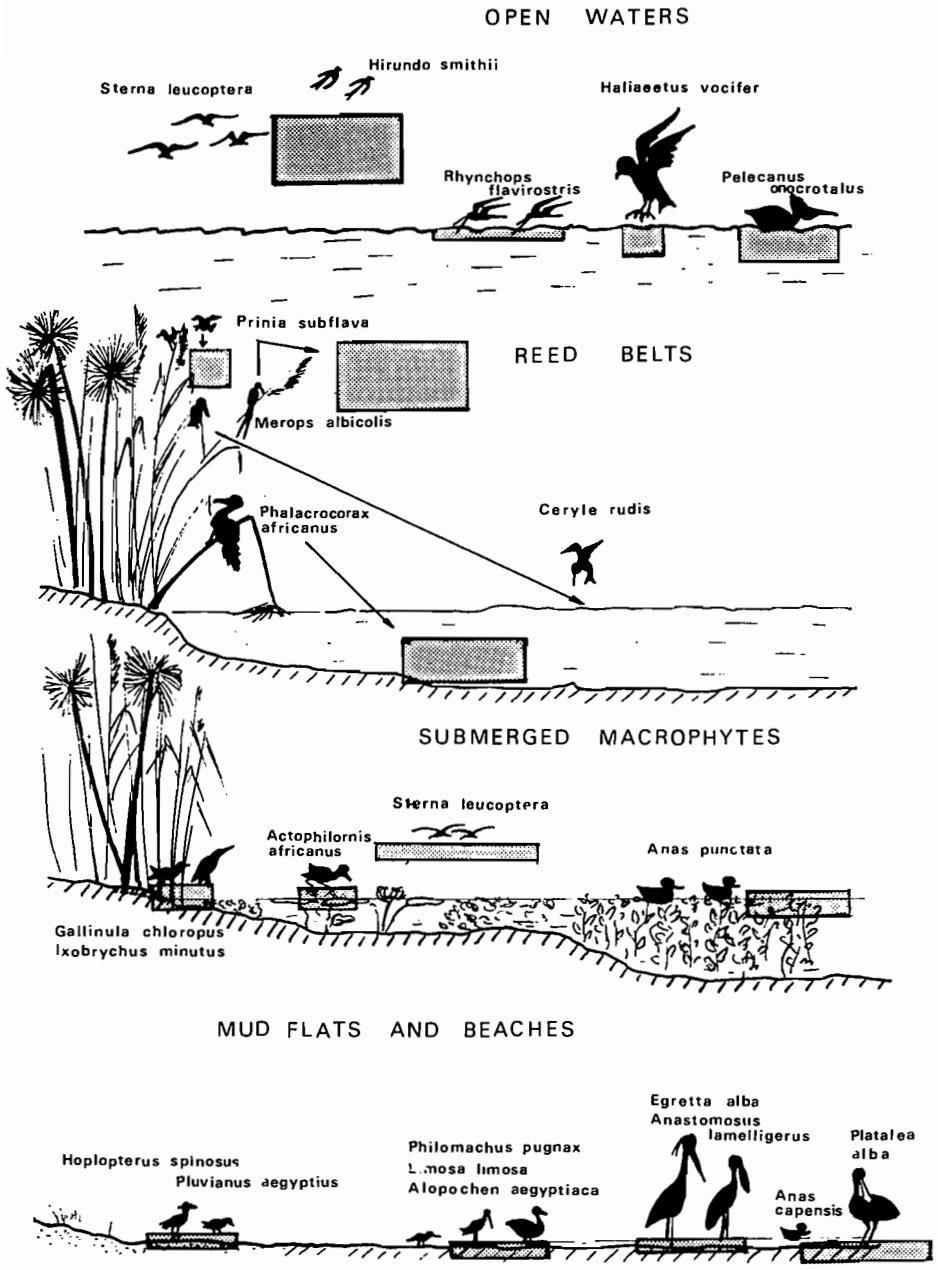

Fig. 1 Zonation of the major sites of the main bird species which depend upon Lake Chad.

Table 1 Different uses of the aquatic environment by the birds; list of the common names and their scientific equivalents.

A. Birds closely dependent upon the aquatic environment	
Pelecanus onocrolatus L.	Rosy pelican
Phalacrocorax a. africanus (Gmelin)	Long-tailed shag
Egretta alba melanorhynchos (Wagler)	African great white heron
Ixobrychus m. minutus (L.)	Red-necked little bittern
Anastomus l. lamelligerus Temminck	African open-bill
Platalea alba Scopoli	African spoonbill
Anas c. crecca L.	Common teal
Anas capensis Gmelin	Cape widgeon
Anas clypeata L.	Shoveller
Anas punctata Burchell	Hottentot teal
Nettapus auritus (Boddaert)	Pygmy goose
Haliaetus vocifer clamans (Daudin)	River eagle
Actophilornis africana (Gmelin)	Lily trotter
Microparra capensis (Smith)	Lesser lily trotter
Limosa l. limosa (L.)	Black-tailed godwit
Tringa glareola L.	Wood sandpiper
Tringa stagnatilis (Bechstein)	Marsh sandpiper
Tringa totanus (L.)	Common redshank
Himantopus h. himantopus (L.)	Black-winged stilt
Rhynchops flavirostris Vieillot	Scissor-bill
Sterna n. nilotica Gmelin	Gull-billed tern
Sterna leucoptera Temminck	White-winged black tern
Sterna h. hybrida Pallas	Whiskered tern
Sterna tschegrava Lepechin	Caspian tern
Ceryle r. rudis (L.)	Pied kingfisher
Alcedo cristata Pallas	Malachite kingfisher
B. Birds with mixed diet	
Podiceps ruficollis capensis Salvadori	African little grebe
Butorides striatus atricapillus (Afzelius)	African green-backed heron
Dendrocygna viduata (L.)	White-faced duck
Plectropterus g. gambensis (L.)	Spur-winged goose
Anas a. acuta L.	Pintail
Gallinula c. chloropus (L.)	African moorhen
Limnochorax flavirostra (Swainson)	Black crake
Philomachus pugnax (L.)	Ruff and reeve
Calidris minuta (Leisler)	Little stint
Ceyx p. picta (Boddaert)	Pygmy kingfisher
Merops albicollis Vieillot	White-throated bee-eater
Merops p. pusillus Muller	Least bee-eater

Table 1 (continued).

B. Birds with mixed diet	
Merops b. bulocki Vieillot	Red-throated bee-eater
Merops superciliosus chrysocercus (Cabanis & Heine)	Blue-cheeked bee-eater
Riparia r. riparia (L.)	Sand martin
Hirundo s. smithii Leach	Wire-tailed swallow
Acrocephalus rufescens chadensis (Alexander)	Rufous cane-warbler
Acrocephalus gracilirostris neglectus (Alexander)	
Prinia subflava pallescens Madarasz	West african prinia
Nectarinia p. pulchella (L.)	Beautiful long-tailed sunbird
Lagonosticta s. senegala (L.)	Senegal fire-finch
C. Birds using the environment as a supplement	
Tringa erythropus (Pallas)	Dusky redshank
Pluvianus aegyptius (L.)	Egyptian plover
Glareola p. pratincola (L.)	West african pratincole
Bubo africanus cinerascens Guerin	Spotted eagle-owl
Bubo lacteus (Temminck)	Milky eagle-owl
Sylvia c. curruca (L.)	Lesser whitethroat
Cisticola galactotes Lynes	Rufous grass-warbler
Camaroptera brachyura brevicaudata (Cretzschmar)	Grey-backed camaroptera
Ploceus melanocephalus capitalis (Latham)	Niger black headed weaver
D. Birds using the environment occasionally)	
Egretta g. garzetta (L.)	Little egret
Bostrychia hagedash (Reichenow)	West african hadada
Sarkidiornis m. melanota (Pennant)	Comb goose
Burhinus senegalensis (Swainson)	Senegal thick-knee
Vanellus spp.	Plovers
Caprimulgus eximius Temminck	Zinder golden nightjar
Caprimulgus c. climacurus Vieillot	Long-tailed nightjar
Apus a. affinis (Gray)	Little african swift
Phylloscopus sibilatrix (Bechstein)	Wood-warbler
Cisticola r. ruficeps (Cretzschmar)	Redpate grass-warbler
Ploceus l. luteolus (Lichtenstein)	Slender-billed weaver

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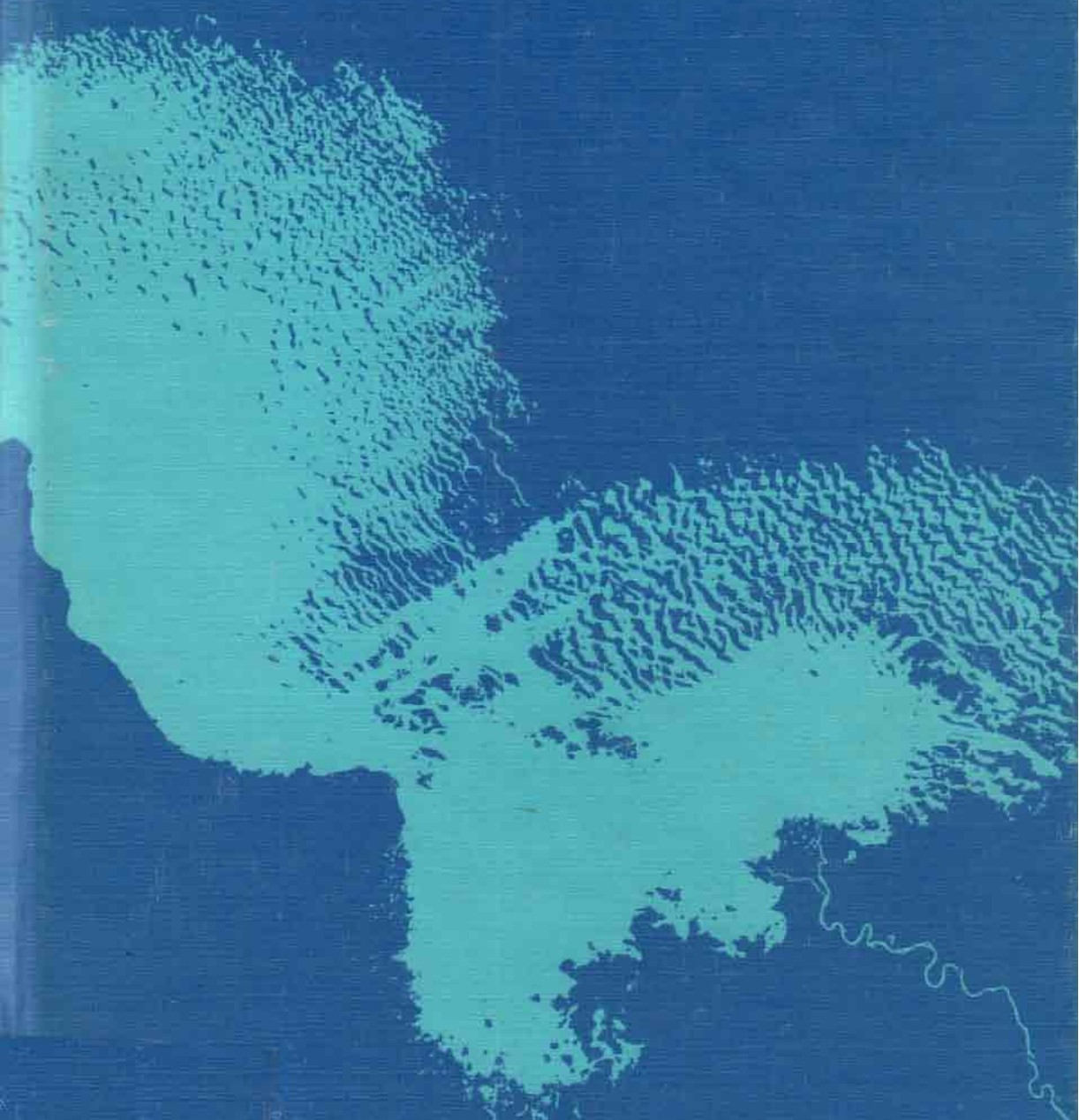

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